WITH WATER IN MIND AN OCCASIONAL SERIES

What goes in upriver ...

BRIAN PETERSON • Star Tribune 1999

In southwestern Minnesota this ditch between cornfields north of Boyd carried water and fertilizer runoff toward Ten Mile Creek, Lac Qui Parle River and the Minnesota River west of Montevideo. The excess phosphorus led to huge algae blooms downstream.

. . . must flow down

But by thinking of cities as eco-systems, one can help prevent pollution from the start.

By LARRY BAKER

The history of modern urbanization has been haphazard, often resulting in misery and, sometimes, catastrophe. With half the Earth's population now living in cities and resources become scarcer, we must do better if we are to have a sustainable future. We can, if we adjust our thinking. ¶ A brief history of the development of sewage disposal in London at the beginning of the Industrial Era illustrates the point. In the early 1800s, the "water closet" (precursor of the modern flush toilet) became popular in London. The devices were enthusiastically accepted (no more chamber pots!), but there was an oversight. The water closets discharged far more water than household cesspools could handle. Cesspools overflowed throughout London, creating a putrid quagmire in city streets and spreading cholera. To deal with the problem, Parliament passed a "Cholera Bill" in 1846, requiring buildings to discharge wastes to storm sewers, which up until that time served mainly as conduits for rainwater. This solved the problem of overflowing cesspools, but now raw wastewater grossly polluted the Thames River. The summer of 1858 was dubbed "the Great Stink," with a stench so bad that Parliament was forced to adjourn. ¶ Cities in the United States also became sewered in the second half of the 1800s, leading to discharges of raw sewage to rivers. Unlike the situation in London, where the Thames flowed to the ocean, many U.S. cities were located upstream of other cities, so one city's wastewater became part of a downstream city's water supply.

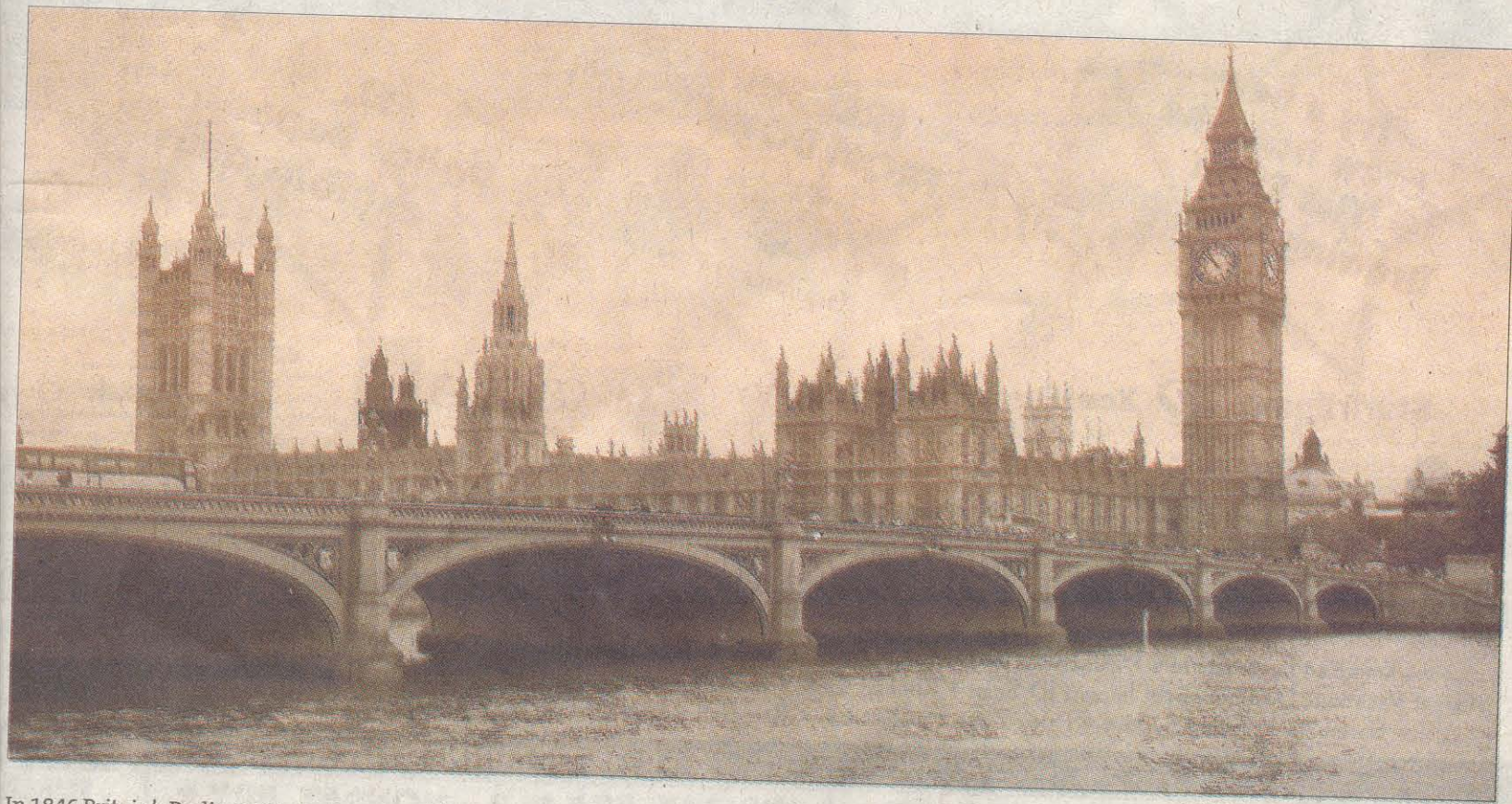
Baker continues: Nearly half our rivers remain "impaired." **AA5** ►

Larry Baker is a senior fellow at the University of Minnesota's Water Resources Center.

ABOUT THIS SERIES

"With Water in Mind" is a long-term project by the Star Tribune's editorial page staff and online staff. The goal of the series is to examine issues surrounding water: efforts to protect it, pressures to exploit it, dangers that threaten it, its role in Minnesota culture and its meaning in our lives.

To see the entire series, visit startribune.com/water.



In 1846 Britain's Parliament, above, ordered buildings to discharge sewage into storm sewers. The result was serious pollution of the Thames River.

VINICIUS TUPINAMBA • Shutterstock

What goes in upriver must flow down

◂ BAKER FROM AA1

A consensus developed among engineers: rather than treat sewage, it would be more economical to rely upon dilution and treatment of drinking water by the downstream cities. Unfortunately, the technology for treating drinking water treatment was inadequate, leading to a surge of typhoid.

The advent of chlorination in water treatment in 1905 quickly nearly eliminated typhoid within a few decades, but gross sewage pollution continued until the surface of the Cuyahoga River in Ohio caught fire in 1969. This wakeup call led to passage of the Federal Clean Water Act a few years later. Although most cities now provide some level of wastewater treatment, nearly half our rivers remain legally "impaired," largely from pollution.

We are not destined to continue down this haphazard path. In recent years, scientists from many disciplines have come together to analyze cities as "ecosystems" — natural systems with humans as integral components. In this model, humans alter ecosystems through their actions, but they also experience the effect of these changes, whether positive or negative. "Life cycle analysis" techniques allow us to track chemicals from their origin, through manufacturing processes, into consumption and finally to wastes (from "cradle to grave"). This can reveal new methods to prevent the formation of pollution rather than rely upon treatment at the end of the pipe. We can now simulate the balance of water with enough accuracy to allow us to plan for major droughts long before they occur.

To illustrate the application of ecosystem thinking, consider the problem of nitrate pollution in the Mississippi River. Nitrate from Midwest farms enters the Mississippi River and ends up in the Gulf of Mexico, where it causes algae blooms. These blooms then die and decompose in deep water, consuming oxygen and making the bottom uninhabitable by fish,

the bottom uninhabitable by fish, shrimp and other organisms. Since we learned about this sequence of events, a great deal of effort has been exerted to encourage farmers to use less fertilizer and improve their farming practices, but these have met with little success.

Another alternative would be a minor modification of the urban diet. Most nitrogen in our diet is in the form of protein, of which we consume 30 percent more than we should. Suppose we reduced protein consumption by 30 percent, and lowered the amount of protein coming from meat (from two-thirds of total to one-half). These changes would greatly reduce the amount of crops needed to support the Twin Cities, especially because farmers would need to feed less of their crops to animals. Such a dietary change would reduce the estimated amount of nitrogen fertilizer used by these farms by a whopping 40 percent — far more than any farmer could achieve by more careful use of fertilizer. This modest change in diet would also be a "win-win" solution, benefiting not only the Gulf of Mexico, but also our waistlines.

"Urban ecosystems" is not an oxymoron. It means connecting the dots to create a holistic view of how our activities change our environment. We didn't have the tools to do that at the beginning of the Industrial Era, but we do now.

Our society routinely collects vast amounts of data that could be used as a starting place for analysis of urban ecosystems. High-resolution satellite imagery and ground-based networks of sensors make it possible to monitor just about anything, and this data can be analyzed on computers that are a thousand times faster than they could 10 years ago. The main limitation now is imagination, not technology.

Historically, two views of nature have emerged in American history. One is "manifest destiny," in which humans overcome nature. The other is a vision of pristine nature, where any human influence is undesirable, even evil. As we learn to understand our cities as ecosystems, we will come to learn that humans are not above nature, nor below it, but an integral part of it. This understanding will be essential to our survival.